Claims

1) Method for altering plant characteristics selected from one or more of increased yield, increased biomass, altered architecture or altered cell division of a plant, comprising increasing expression in a plant of a nucleic acid sequence encoding plant class-2 non-symbiotic haemoglobin.

2) Method of claim 1, wherein said increased yield comprises increased seed yield.

3) Method according to claim 1 or 2, wherein said nucleic acid encoding plant class-2 non-symbiotic haemoglobin is an isolated nucleic acid from a dicotyledonous plant, preferably from Brassicaceae, more preferably from *Arabidopsis thaliana*, most preferably the isolated nucleic acid encodes a protein according to SEQ ID NO 4, or is as represented by SEQ ID NO 3.

4) Method for increasing abiotic stress tolerance of a plant, comprising increasing expression in a plant of a nucleic acid sequence encoding plant class-2 non-symbiotic haemoglobin.

5) Method of claim 4, wherein said abiotic stress is osmotic stress.

6) Method for increasing high temperature stress tolerance of a plant, comprising increasing expression in a plant of a nucleic acid sequence encoding plant haemoglobin, preferably a non-symbiotic haemoglobin, more preferably a class-2 non-symbiotic haemoglobin.

7) Method of any of claims 4 to 6, wherein said nucleic acid sequence encoding a plant class-2 non-symbiotic haemoglobin is isolated from a dicotyledonous plant, preferably from Brassicaceae, more preferably from *Beta vulgaris*, most preferably the isolated nucleic acid encodes a protein according to SEQ ID NO 2, or is as represented by SEQ ID NO 1.

8) Plant obtainable by a method according to any of claims 1 to 7.

9) An isolated nucleic acid encoding a plant class-2 non-symbiotic haemoglobin selected from:

(i) a nucleic acid sequence comprising a sequence according to SEQ ID NO 1 or the complement thereof;

(ii) a nucleic acid sequence encoding a protein with an amino acid sequence which is at least, in increasing order of preference, 79%, 80%, 85%, 90%, 95%, 96%, 97%, 98% or 99% identical to the amino acid sequence as given in SEQ ID NO 2;

(iii) a nucleic acid sequence encoding a protein comprising the amino acid sequence as given in SEQ ID NO: 2;

(iv) a nucleic acid sequence according to any of (i) to (iii) which is degenerate as a result of the genetic code;

(v) a nucleic acid sequence which is a splice variant of a nucleic acid according to any of (i) to (iv);

(vi) a nucleic acid sequence which is divergent due to differences between alleles encoding a protein as given in SEQ ID NO: 2, or as defined in (i) to (v);

(vii) a nucleic acid sequence encoding an immunologically active and/or functional fragment of a protein encoded by a DNA sequence according to any of (i) to (vi); and,

(viii) a nucleic acid sequence which hybridises under stringent conditions to any one of the sequences defined in (i) to (vii),

with the proviso that none of (i) to (viii) include the sequence as given in GenBank acc no BE590299 or BQ586966.

10) An isolated plant class-2 non-symbiotic haemoglobin comprising one of the polypeptides selected from:

(i) a polypeptide as represented by SEQ ID NO 2;

(ii) a polypeptide with an amino acid sequence which is at least, in increasing order of preference, 79%, 80%, 85%, 90%, 95% 96%, 97%, 98% and 99% identical to the amino acid sequence given in SEQ ID NO 2;

(iii) a polypeptide encoded by a nucleic acid of claim 9;

(iv) a homologue, derivative, immunologically and/or functional fragment of a protein as defined in any of (i) to (iii).

11) A nucleic acid construct comprising:

(i) an isolated nucleic acid sequence according to claim 9;

(ii) one or more control sequences controlling expression of the nucleic acid sequence of (i); and optionally,

(iii) a transcription terminator sequence.

12) Construct of claim 11 wherein said isolated nucleic acid sequence is as represented by SEQ ID NO 1.

13) A host cell comprising a nucleic acid according to claim 9 or a construct according to claim 11 or 12, wherein said host cell is a bacterial, yeast, fungal, plant or animal cell.

14) Method for producing a transgenic plant having altered growth characteristics comprising the steps of:

(i) introducing into a plant or plant cell a nucleic acid sequence according to claim 9;

(ii) cultivating said plant or plant cell under conditions promoting regeneration and/or mature plant growth.

15) Plant cell, plant part or plant having at least one of increased yield, increased biomass, increased cell division, increased tolerance to osmotic stress and altered architecture, said plant cell, plant part or plant having increased expression of a nucleic acid sequence encoding a plant class-2 non-symbiotic haemoglobin.

16) Plant cell, plant part or plant having increased tolerance to high temperature stress, said plant cell, plant part or plant having increased expression of a nucleic acid sequence encoding a plant haemoglobin protein.

17) Transgenic plant according to claim 15 or 16, wherein said plant is a crop plant selected from soybean, sunflower, canola, alfalfa, rapeseed or cotton, preferably wherein the plant is a monocotyledonous plant, such as sugarcane, most preferably a cereal, such as rice, maize, wheat, millet, barley, sorghum, oats.

18) Transgenic progeny, transgenic harvestable parts or propagules of a plant according to any of the claims 15 to 17, said harvestable parts selected from seeds, leaves, flowers, fruits, stem cultures, rhizomes, tubers and bulbs.

19) Use of a nucleic acid sequence encoding a plant class-2 non-symbiotic haemoglobin for increasing one or more of yield, biomass or cell division of a plant and/or for altering architecture of a plant.

20) Use of claim 19, wherein said increased yield comprises seed yield.

21) Use according to claim 19 or 20, wherein said nucleic acid sequence encoding a plant class-2 non-symbiotic haemoglobin is isolated from a dicotyledonous plant, preferably from Brassicaceae, more preferably from *Arabidopsis thaliana*, most preferably the isolated nucleic acid is as represented by SEQ ID NO 3.

22) Use of a nucleic acid sequence encoding a plant class-2 non-symbiotic haemoglobin for increasing abiotic stress tolerance of a plant.

23) Use of claim 22, wherein said abiotic stress is osmotic stress.

24) Use of claim 22 or 23, wherein said nucleic acid sequence encoding a plant class-2 non-symbiotic haemoglobin is isolated from a dicotyledonous plant, preferably from Brassicaceae, more preferably from *Beta vulgaris*, most preferably the isolated nucleic acid is as represented by SEQ ID NO 1.

25) Use of a nucleic acid sequence encoding a plant haemoglobin for increasing high temperature tolerance of a plant, preferably said plant haemoglobin is a non-symbiotic haemoglobin, more preferably a class-2 non-symbiotic haemoglobin.

26) Use of claim 25, wherein said nucleic acid sequence encoding plant class-2 non-symbiotic haemoglobin is isolated from a dicotyledonous plant, preferably from Brassicaceae, more preferably from *Beta vulgaris*, most preferably the isolated nucleic acid is as represented by SEQ ID NO 1.

27) Use of haemoglobin or a nucleic acid sequence encoding haemoglobin for altering stress tolerance of yeast.

28) Use of a nucleic acid sequence according to claim 9 and/or of an amino acid sequence according to claim 10 in therapeutic or diagnostic compositions.

29) Use of a nucleic acid sequence according to claim 9 and/or of an amino acid sequence according to claim 10 in modulating levels of O_2 or other compounds.

30) Use of a nucleic acid sequence according to claim 9 and/or of an amino acid sequence according to claim 10 in modifying signal transduction pathways.